

REMARKS

Claims 1-4, 6-10, 12, 14-18, 20-24 and 26 are pending. Claims 5, 11, 13, 19, 25, and 27 are canceled, and claims 1 and 15 are amended with this response. Reconsideration of the application in light of the above amendments and the following remarks is respectfully requested.

I. OBJECTION TO THE SPECIFICATION

The specification was objected to for failing to provide proper antecedent basis for claimed subject matter. Claim 15 has been amended herein to recite "a semiconductor body" and thus have proper antecedent basis. Support for the amendment may be found in applicants' specification, for example, on page 5, lines 15-18. Withdrawal of the objection is therefore respectfully requested.

II. REJECTION OF CLAIMS 1, 2, 7, 8, 15, 16, 21 AND 22 UNDER 35 U.S.C. § 102(b)

Claims 1, 2, 7, 8, 15, 16, 21 and 22 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,155,658 (Inman et al.). Claims 1 and 15 have been amended to recite that the ferroelectric material has a percentage of unit cells oriented with elongated dimensions substantially normal to a generally planar upper surface of the semiconductor body, wherein the percentage is between about 50% or more and about 70% or less. Inman et al. do not teach this feature, but instead teach an orientation of 80% or more. Consequently the reference fails to anticipate claims 1 and 15, as well as the depending claims 2, 7, 8, 16, 21 and 22, respectively. Accordingly, withdrawal of the rejection is respectfully requested.

III. REJECTION OF CLAIMS 3-6, 9-14, 17-20 AND 23-27 UNDER 35 U.S.C. § 103(a)

Claims 3-6, 9-14, 17-20 and 23-27 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Inman et al. in view of published U.S. Application No.

2004/0173826 (Natori) or JP 2003-133604 (Sumi). Claims 5, 11, 13, 19, 25 and 27 are canceled with this response, thereby rendering the rejection thereof moot. Withdrawal of the rejection of the remaining claims is respectfully requested for at least the following reasons.

Claims 1 and 15 recite a ferroelectric material comprising unit cells individually comprising an elongated dimension wherein a percentage thereof have their elongated dimensions substantially normal to a generally planar surface of the semiconductor body, wherein the percentage is about 50% or more and about 70% or less. Inman et al. do not teach this feature. Rather, Inman et al. teach a percentage of "at least 80% and preferably 90% of the ferroelectric material being c-axis oriented." (Col. 3, lines 28-32). Neither Natori nor Sumi remedy the deficiency of the primary reference.

The Office Action appears to implicitly concede that the art does not teach the above range on page 4, paragraph 5 thereof, instead asserting that such range is merely an optimization and constitutes a design choice. Applicants respectfully disagree. As set forth in applicants' specification, for example, on page 8, line 26 – page 9, line 11, the inventors of the present invention discovered and appreciated that a trade-off exists in ferroelectric capacitor performance. For example, while an increased volume orientation improves data retention and switched polarization, at substantially high levels of volume orientation it was discovered that after programming, the capacitor tends to relax to a lower polarization level. Consequently, the inventors of the present invention discovered that ferroelectric material with volume orientation approaching 100% undesirably leads to large relaxation levels, thereby negatively impacting sense margin.

Further, the inventors of the present invention found that at an intermediate range of volume orientation (e.g., 50% to 70%, as claimed), the advantages of improved data retention and switched polarization are obtained without a significant degradation in polarization relaxation. (See, e.g., applicants' specification, page 9, lines 12-30 and Fig. 5D). Therefore contrary to the assertions in the Office Action, the range

recited in the present invention is not a mere design choice, but rather is a function of the inventors' discovery.

In addition, one of ordinary skill in the art would not have been motivated to modify Inman et al. to arrive at the claimed invention. Inman et al. provide no teaching or suggestion that a performance trade-off exists. Rather, Inman et al. appear to encourage maximizing the c-axis orientation. (See, e.g., Col. 4, lines 21-23, stating, "[f]or a good ferroelectric memory, the c-axis orientation should be increased to above 80% and preferably about 90%.") Thus one of ordinary skill in the art would tend to attempt to maximize the c-axis orientation based upon the teaching of Inman et al.

Clearly, the cited art does not teach the features cited in claims 1 and 15, and no suggestion, explicit or implicit, resides in the art that would motivate one to modify Inman et al. in accordance with the present invention. Instead, the reference tends to teach away from the cited range by encouraging a maximization of the c-axis orientation. Lastly, the claimed range does not comprise an optimization of data retention or switched polarization, but rather reflects a discovery by the inventors, heretofore not acknowledged within the cited art, that maximization of c-axis orientation results in degradation of other performance characteristics, and that an intermediate range positively impacts data retention and switched polarization without substantially impacting polarization relaxation. Consequently, the present invention is non-obvious over the cited art. Accordingly, withdrawal of the rejection is respectfully requested.


IV. CONCLUSION

For at least the above reasons, the claims currently under consideration are believed to be in condition for allowance.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should any fees be due as a result of the filing of this response, the Commissioner is hereby authorized to charge the Deposit Account Number 20-0688, TIP346US.

Respectfully submitted,
ESCHWEILER & ASSOCIATES, LLC

By 
Thomas G. Eschweiler
Reg. No. 36,981

National City Bank Building
629 Euclid Avenue, Suite 1210
Cleveland, Ohio 44114
(216) 502-0600

CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Assistant Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: February 15, 2005


Christine Gillroy